for Irrigation to the Government of India. The duties of that office, coming after a career of practical work on irrigation schemes, would give that breadth of view with which a lecturer on so wide a subject as "Irrigation Works" should be endowed.

The irrigation works described in this book include more than the material works of irrigation, such as channels for irrigation and drainage and works of regulation. "Notes on Irrigation *Work*" would seem to be a more appropriate title. For, besides discussing weirs and irrigation channels—irrigation works properly so-called—the author describes what may be termed the embryonic growth of an irrigation project—that is, the preliminary surveys, studies, and calculations, which mark stages of development in the incomplete project. The final chapter, moreover, explains the revenue duties of the canal engineer of India. The canal engineer of Egypt is fortunate in escaping the harassing duties of revenue management, which in India are part of an irrigation officer's duties.

A separate chapter deals with the development of irrigation in Egypt since 1884 in a concise and comprehensive summary, and concludes with a short reference to possible future schemes. With this exception and a few references to works in Egypt under the head of weirs, the author has wisely drawn his illustrations from works in India with which he is personally acquainted, and treats his subject generally from the point of view of India. He thus avoids a fruitful source of error. The "eminent authority" whom he quotes as misconceiving the cause of the failure of Narora weir, leant too heavily on the broken reed of an official report, and fell into error for want of first-hand knowledge of the subject which he was using as an illustration. Mr. Mackenzie, with more caution, gives his opinion "with all reserve" as to the cause and manner of the accident. He may be right, but, as he points out, the local engineers decline to commit themselves to a positive opinion. There is, at least, one more theory of the cause of the accident, which has not yet appeared in print. Whatever the real cause may have been, the discussion, which has followed on the accident to the Narora weir and to which the author makes his contribution in his book, has been fruitful in establishing sounder principles upon which to base the design of weirs than had been recognised before.

A chapter on the design of irrigating channels is chiefly concerned with the important matter of silt deposit in the small distributing channels in the delivery zone of an irrigation system; but the method of water distribution on the rotation system is also described in general outline. An introductory chapter refers to the performance in the distant past and the promise in the near future of irrigation in Mesopotamia; also to the conditions which create a need of irrigation and drainage, and to the good effects of moderation and to the evil effects of excess in either.

The book is written in good, plain English, and is free from unnecessary technicalities, as lectures addressed to students should be, and as, indeed, all lectures might well be. The substance of the book is sound instruction, and irrigation engineers, as well as students, will find much useful knowledge in it, clearly expressed and convincingly demonstrated. A careful perusal of it would be a valuable preparation for a more detailed study of irrigation works and administration, either by books or by actual practice.

THE CRYSTALLINE SCHISTS.

Die Kristallinen Schiefer. Eine Darstellung der Erscheinungen der Gesteinsmetamorphose und ihrer Produkte. By Prof. U. Grubenmann. Zweite Auflage. Pp. xii+298+xii plates. (Berlin: Gebrüder Borntraeger, 1910.) Price 20 marks.

ORIGINATING in a course of lectures at Zürich, based largely on the author's own researches among the crystalline schists of the Alps, Prof. Grubenmann's book has already made for itself a place in petrographical literature. The two parts, general and special, issued separately in 1904 and 1906 respectively, are in the new edition included more conveniently in a single volume; but the general plan of the work remains unchanged, and the additions found here result merely from the growth of material during the last five years. Thus, in the first part, there is some revision of those sections which deal with the application of physico-chemical principles, and some interesting illustrations of original sedimentation, mixed injection, &c., are drawn from recent work in Finland and Scandinavia. The additions made to the second part of the book are perhaps more important, including a large number of chemical analyses, and some simplification of the classificatory scheme.

The general principles of Prof. Grubenmann's treatment are already known to petrologists. His classification is based primarily upon chemical composition. No distinction is made between metamorphosed sediments and metamorphosed igneous rocks, for it is urged that, even if their original characters are not wholly obliterated, metamorphism has set so marked a stamp upon them that the new characters supersede the old in significance. The author adopts Osann's chemical classification, originally devised for igneous rocks alone, and in this way arrives at twelve groups of crystalline schists. In each group there is made further a threefold division corresponding with different zones of depth, where the conditions as regards temperature and pressure are presumed to differ in an important degree. This division, an amplification of Van Hise's conception, is described as a "physical-geological" one; but, since the actual depths of the several zones are not the same in different groups of rocks. the geological significance is merely of a limited scope.

The distinction made between crystalline schists and "contact-rocks," which latter are excluded from consideration, seems to us an artificial one, and is difficult to defend in a scheme professedly based on the actual characters of the rocks. Barrow has shown that the great metamorphic aureoles of the Scottish Highlands can be divided into three zones, having sillimanite, cyanite, and staurolite as their

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characteristic minerals. Here it is clear that the formation of one or other of these silicates depended solely on temperature, and in no wise on depth; but in the book before us sillimanite figures as a distinctive mineral of the deepest zone, and cyanite and staurolite of the middle zone. We are led to suspect that the author has overrated the influence of pressure as a factor in metamorphism. Such experimental data as we possess go to show that even very high pressures may not displace greatly the temperature-limits of stability of the rock-forming silicates.

Apart from such considerations, more or less theoretical, the work is a mine of valuable information. The classification at least serves its purpose as a standard of comparison, and the systematic treatment of the structures of crystalline schists will be especially useful.

A. H.

PLANT LIFE OF MARYLAND.

Maryland Weather Service. By F. Shreve, M. A. Chrysler, F. H. Blodgett, and F. W. Besley. Vol. iii., The Plant Life of Maryland. Pp. 533. (Baltimore, U.S.A.: Johns Hopkins Press, 1910.)

THE weather service of the American State of Maryland, maintained by the Johns Hopkins University, Maryland Agricultural College, and the United States Weather Bureau, receives a broad interpretation. The first volume of the series dealt with the physiography and meteorology of the State, the second presented the results of many years' study of the climate and weather of Baltimore and vicinity, while the third is connected with the former in so far as vegetation is dependent upon physiography and climatic conditions. The main purpose of the present volume is to present an ecological description of the vegetation, which is demarcated into three zones. The coastal zone spreads inland as far as the "fall-line"; thence to a contour line of 1500 feet extends what is designated as the "midland" zone, and a mountain zone comprises land above that altitude. The term, "fall-line," it may be noted, is nowhere explained; reference to another source shows that at the junction of the Cretaceous or Cenozoic with older formations the rivers have falls or rapids.

The division into these three zones is suggested by the occurrence in the central counties of many species having a wide range, coupled with the appearance of a conspicuous southern floral element in the coastal zone, and an appreciable admixture of northern elements in the mountain zone; these facts throw some light upon the historical sequence of events. As for the details, these are well elaborated, and due consideration is given to the limits imposed by soil constitution, both physical and chemical, and by topography. Climatic conditions are extremely favourable to tree growth, so that forests are important in each of the zones. Originally extensive forests of white pine and pitch pine existed in the western part of the State, but now the white pine is limited to isolated specimens. The converse process is seen in southern Maryland, where scrub pine spreads over land cultivated before the Civil War; this is a first stage that is altered by the incursion of oak, and later by hickory. Apart from the forests, the various marsh regions in the coastal zone are interesting, also the serpentine barrens and Susquehanna gravels in the midland zone. To make the survey more complete, sections are devoted to agricultural and forestry matters, and an account of the floristic geography with a list of plants is supplied by Dr. F. Shreve. The text is illustrated by a considerable number of excellent photographs and by a few maps that would be more useful if the scale were larger. The volume is highly creditable to Dr. Shreve and his associates, and will take rank with the best local ecological studies.

OUR BOOK SHELF.

Salvarsan or 606 (Dioxy-Diamino-Arsenobenzol): its Chemistry, Pharmacy, and Therapeutics. By Dr. W. H. Martindale and W. W. Westcott. Pp. xv+77. (London: H. K. Lewis, 1911.) Price 5*s.* net.

IN this little book, the authors summarise all the essential information contained in the numerous publications that have appeared up to date on the Ehrlich-Hata remedy for syphilis. "Salvarsan" is the trade name given to the compound—which is chemically dioxy-diamino-arsenobenzol—synthesised by Ehrlich and his collaborators, and first introduced under the designation "606." Ehrlich has for some time past been studying the effects of various anilin dyes and organic compounds of arsenic on trypanosomes and other protozoan parasites. In quick succession he brought out more or less effective remedies, such as trypan red for bovine piroplasmosis (Texas fever), atoxyl and arsenophenylglycine for trypanosomiasis of man and animals, and, finally, "606" for spirilloses, diseases caused by spirillar micro-organisms, such as relapsing fever and syphilis.

S. Hata, of Tokio, conducted researches with "606" on the spirochætes of relapsing fever in rats and mice, and subsequently on the spirillosis of fowls. The drug was found to be extraordinarily efficacious, and it was an obvious further step to try it on syphilis, another spirochæte disease, with correspondingly successful results. Mercury has been used for centuries as a remedy, the one remedy, for syphilis, but a proper course of treatment with it extends over months, and it is impossible to make many patients realise the necessity for this, and hence the disease relapses, with, in many instances, dire results. With salvarsan, however, it is claimed that a single dose will in many instances effect a cure, an enormous advantage.

There can be little doubt that in salvarsan we have a most potent remedy for the cure of syphilis, though whether it will do all that has been claimed for it time alone can show. Unfortunately the drug is toxic, and requires to be administered in a special manner; it is not altogether free from danger in particular cases, and is contra-indicated in some of the worst forms of syphilis, *e.g.*, when the nervous system is involved. In the book under review, the authors give complete directions for the preparation and administration of the drug, and epitomise the precautions to be taken and the contra-indications for its use, and it should prove a very useful guide for the practitioner. Summaries of some of the principal contributions on the remedy are included, and a full bibliography is appended.

R. T. H.

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